Pertussis

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To prevent illness and death among high-risk persons and among persons who may transmit pertussis to high-risk persons.
2. To identify and evaluate contacts and recommend appropriate preventive measures, including exclusion, antibiotic prophylaxis and/or immunization.
3. To educate exposed persons about signs and symptoms of disease, thereby facilitating early diagnosis and treatment and preventing further spread.
4. To vaccinate exposed, underimmunized children.
5. To monitor the epidemiology of pertussis in Washington state.

B. Legal Reporting Requirements

1. Health care providers: **immediately notifiable to local health jurisdiction.**
2. Hospitals: **immediately notifiable to local health jurisdiction**.
3. Laboratories: notifiable to local health jurisdiction within 2 workdays.
4. Local health jurisdictions: notifiable to the Washington State Department of Health (DOH) Communicable Disease Epidemiology Section (CDES) within 7 days of case investigation completion or summary information required within 21 days.

C. Local Health Jurisdiction Investigation Responsibilities

1. Begin routine case investigation within one working day.
2. Make sure the case is appropriately treated and recommend measures to prevent further spread from the case.
3. Identify and evaluate contacts; educate and recommend measures to prevent further spread from potentially infected contacts.
4. Facilitate the transport of specimens to assist with the diagnosis of other cases.
5. Report all *confirmed* and *probable* cases (see Section 3C) to CDES. Complete the pertussis case report form (at www.doh.wa.gov/notify/forms/pert.pdf) and enter the data in the Public Health Information Management System (PHIMS). Remember to ask and enter the vaccination history for <u>all</u> patients.

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent:

Bordetella pertussis, a fastidious pleomorphic gram-negative bacillus.

B. Description of Illness

Classic pertussis, whooping cough, is characterized by spasms of severe coughing

(paroxysms) lasting from 6 to 10 weeks. Pertussis should be suspected when any cough is paroxysmal or lasts more than a week. Pertussis typically lacks fever and classically progresses through three stages:

1. Catarrhal (1–2 weeks): mild, upper respiratory tract symptoms gradually develop with an intermittent non-productive cough.
2. Paroxysmal (1–2 weeks or longer): spasms of cough end with a gasp, whoop, or vomiting (post-tussive emesis). Adolescents and adults may have less dramatic symptoms.
3. Convalescent (2–6 weeks or longer): gradual resolution of the paroxysmal coughing.

Pertussis can occur at any age, regardless of vaccination history. Apnea rather than cough may be the initial or most important symptom in infants less than 6 months of age. A clue to the diagnosis in **infants only** is an elevated white blood count (over 15,000/mm³) with a predominance of lymphocytes. Pertussis among older children, adults, and those previously immunized can be milder than classic whooping cough; the symptoms may be no more distinctive than other upper respiratory tract infections.

Death and serious complications occur mainly in infants and can include apnea, malnutrition, pneumonia, pulmonary hypertension, seizures, and encephalopathy. Older individuals may suffer from sleep deprivation, sweating, syncope, rib fractures, hernia, and urinary incontinence.

The differential diagnosis of pertussis includes other respiratory pathogens such as adenoviruses, *Bordetella parapertussis*, *Mycoplasma pneumoniae*, *Chlamydophila* (formerly *Chlamydia*) *pneumoniae*, and respiratory syncytial virus.

A brief note about *B. parapertussis*, a less common, non-reportable disease requiring no public health action: Parapertussis has similar but milder symptoms than pertussis and serious complications are rare. Parapertussis can be distinguished from pertussis by culture or PCR. Unfortunately, infection with *B. pertussis* provides little cross-protection against subsequent infection with the *B. parapertussis* and vice versa; pertussis vaccine does not prevent parapertussis. However, antibiotic treatment and prevention messages for parapertussis are the same as those for pertussis.

C. Pertussis in Washington State

DOH currently receives approximately 400 to 1000 reports of pertussis per year.

D. Reservoirs

Humans.

E. Modes of Transmission

B. pertussis is transmitted person to person through direct contact with respiratory secretions or via droplets produced from talking or coughing. The precise duration and intensity of exposure needed to cause infection is unclear; an hour or more in a confined space with a contagious individual is generally felt to be a significant exposure. Secondary attack rates are 25–60% among household contacts in the developed world and can reach 80% among fully susceptible persons (i.e., neither immunized nor previously infected).

F. Incubation Period

Typical incubation period is 7–10 days (range 5–21 days).

G. Period of Communicability

Pertussis is highly contagious. Persons with pertussis are most infectious during the catarrhal period and the first 2 weeks after cough onset. Communicability then decreases but may continue for 3 or more weeks after the paroxysmal cough onset. Therefore, cases are contagious from symptom onset to 21 or more days after the start of the paroxysmal cough or until completion of 5 days of appropriate antibiotic therapy. Some individuals, especially infants, may remain culture-positive for several weeks; there is no chronic carrier state.

H. Treatment

Early treatment of pertussis cases (within first two weeks of paroxysmal cough) is much more effective in preventing secondary spread than treatment started later. Initiating treatment more than 3 weeks after onset of paroxysmal cough is unlikely to be beneficial and should be limited to situations in which there is on-going contact with high-risk individuals such as an infant under 1 year of age or a pregnant woman in the third trimester.

Antibiotics used for treatment and prevention

The antibiotics and dosages used for treatment and post-exposure disease prevention (often referred to as "chemoprophylaxis") are the same (see Table 1 below). Antibiotics given early in the catarrhal stage may attenuate the disease; when given during the paroxysmal stage communicability is reduced but there is little effect on the course or duration of illness. Azithromycin, clarithromycin and erythromycin eradicate *B. pertussis* from the nasopharynx, rendering infectivity minimal 5 days after starting treatment with any of these agents. In principle, chemoprophylaxis of asymptomatic contacts helps to interrupt transmission by eliminating the organism during the incubation period. Azithromycin and erythromycin are both pregnancy category B (minimal risk); clarithromycin and trimethoprim-sulfamethoxazole are category C and should be used in consultation with a prenatal care provider.

1. Azithromycin (Zithromax®)

Azithromycin is as effective as a 14-day course of erythromycin; greater convenience and tolerability is accompanied by a high price (typically over $50 for an adult course). The most frequently reported side effects are gastrointestinal; drug interactions are uncommon but always inquire about other concurrent medications.

Note: Because of the very long half-life of azithromycin, recently released 1 and 3-day courses (with the same total dose of 30mg/kg for kids or 1.5 grams for adults) may be as effective as the 5-day course; however, they have not yet been studied for pertussis and are not currently recommended for this disease.

2. Clarithromycin (Biaxin®)

A 7-day course of clarithromycin is as effective as a 14-day course of erythromycin; again greater convenience and tolerability come at a higher price. Although uncommon,

the most frequently reported side effects are gastrointestinal; drug interactions occur so inquire about concurrent medications.

3. **Erythromycin (many brands and generic)**

   Erythromycin, especially the estolate preparation, has long been the recommended drug for pertussis treatment and prophylaxis. Patient compliance with the cumbersome 4-times-daily, 14-day course is poor and gastrointestinal side effects are common. Although the CDC still recommends a 14-day course of erythromycin (see Table 1), one study has shown that a 7-day course may be equally effective (Halperin SA, et al. Seven days of erythromycin estolate is as effective as fourteen days for treatment of *Bordetella pertussis* infections. Pediatrics. 1997;100(1):65–71).

   Use of erythromycin in infants can be complicated by infantile hypertrophic pyloric stenosis; when prescribing erythromycin to infants under 3 months of age providers should inform parents about the possible risks for infantile hypertrophic pyloric stenosis (IHPS) and counsel them about signs of developing IHPS. Overall, serious side-effects are rare with erythromycin UNLESS the patient is taking other medications; be sure to ask and consult with a pharmacist if there is any concern about interactions.

4. **Trimethoprim-Sulfamethoxazole, TMP-SMX (Bactrim®, Septra®, generic)**

   TMP-SMX also appears to be effective in eradicating *B. pertussis* from the nasopharynx; it is recommended as an alternative antibiotic for patients who cannot tolerate any of the above macrolides. This drug can cause nausea, vomiting, and rash. TMP-SMX is contraindicated for infants aged < 2 months (risk for kernicterus).

Table 1: Recommended antimicrobial treatment and postexposure prophylaxis for pertussis, by age group

	Primary agents			Alternate agent*
Age group	Azithromycin	Erythromycin	Clarithromycin	TMP-SMZ
Under 1 month	Recommended agent. 10 mg/kg per day in a single dose for 5 days (only limited safety data available.)	Not preferred. Erythromycin is associated with infantile hypertrophic pyloric stenosis. Use if azithromycin is unavailable; 40–50 mg/kg per day in 4 divided doses for 14 days	Not recommended (safety data unavailable)	Contraindicated for infants aged < 2 months (risk for kernicterus)
1–5 months	10 mg/kg per day in a single dose for 5 days	40–50 mg/kg per day in 4 divided doses for 14 days	15 mg/kg per day in 2 divided doses for 7 days	Contraindicated at age <2 months. For infants aged ≥2 months, TMP 8 mg/kg per day, SMZ 40 mg/kg per day in 2 divided doses for 14 days
Infants (6 months and older) and children	10 mg/kg in a single dose on day 1 (maximum: 500 mg/day) then 5 mg/kg per day on days 2–5 (maximum: 250 mg/day)	40–50 mg/kg per day (maximum: 2 g per day) in 4 divided doses for 14 days	15 mg/kg per day in 2 divided doses (maximum: 1 g per day) for 7 days	TMP 8 mg/kg per day, SMZ 40 mg/kg per day in 2 divided doses for 14 days (maximum: adult dose)
Adults	500 mg in a single dose on day 1 then 250 mg per day on days 2–5	2 g per day in 4 divided doses for 14 days	1 g per day in 2 divided doses for 7 days Pregnancy category C	TMP 320 mg per day, SMZ 1,600 mg per day in 2 divided doses for 14 days Pregnancy category C

* Trimethoprim sulfamethoxazole (TMP-SMZ) can be used as an alternative agents to macrolides in patients aged ≥ 2 months who are allergic to macrolides, who cannot tolerate macrolides, or who are infected with a rare macrolide-resistant strain of *B. pertussis*.

Source: MMWR 2005;54:RR–14

I. Immunity

The duration of immunity after natural infection with *B. pertussis* is postulated to be lifelong but laboratory confirmed second infections have been reported. Efficacy of the "whole-cell" vaccine was 70–90%, but after 5–10 years protection waned. The acellular vaccine series (recommended in the United States for the entire series since 1996) has an efficacy of approximately 80% in young children but immunity also appears to wane after 5–10 years. Those over age 10 years are considered fully susceptible, unless they have received a dose of Tdap (Tetanus toxoid, reduced diphtheria toxoid, acellular pertussis vaccine), although duration of immunity after receiving this relatively new vaccine is unknown.

3. CASE AND CONTACT DEFINITIONS

A. Clinical Criteria for Diagnosis of Cases

A cough illness lasting **≥ 2 weeks** with one of the following: paroxysms of coughing, inspiratory "whoop," or post-tussive vomiting, without other apparent cause (as reported by a health professional).

B. Laboratory Criteria for Diagnosis of Cases

1. Isolation of *Bordetella pertussis* from clinical specimen or
2. Positive polymerase chain reaction (PCR) assay for *B. pertussis*.

C. Case Definition (1997)

1. Probable: a case that meets the clinical case definition, is not laboratory confirmed, and is not epidemiologically linked to a laboratory-confirmed case.
2. Confirmed:
   a. a case with an acute cough illness of any duration that is culture confirmed, or
   b. a case that meets the clinical case definition and is confirmed by PCR, or
   c. a case that meets the clinical case definition and is epidemiologically linked directly to a culture or PCR-confirmed case.

   Comments:

   - The clinical case definition is appropriate for endemic or sporadic cases. In outbreak settings, including households, a case may be defined as a cough illness lasting ≥2 weeks.
   - Because some studies have documented that direct fluorescent antibody testing of nasopharyngeal secretions has low sensitivity and variable specificity, it should not be relied on as a criterion for laboratory confirmation.
   - Serologic testing for pertussis is available in some areas but is not standardized and, therefore, should not be relied on as a criterion for laboratory confirmation for national reporting purposes.
   - At this time, a case with a positive PCR result **must** meet the clinical case definition in order to be counted as a confirmed case. It is important to let the person know that

you will be checking back to learn the duration of cough if the initial interview is done early in the course of the illness. If you are unable to document a cough duration of at least two weeks in a person with a positive PCR, the report cannot be classified as a "confirmed" or "probable" case. Instead, these cases should be classified as "suspect" and marked as outbreak-related if appropriate. For case and contact management purposes, these individuals should be considered likely to have pertussis. Only confirmed and probable cases are reported to CDC.

D. Close Contact (of a pertussis case)

Pertussis spreads by direct contact with infectious respiratory secretions by droplet transmission. Such droplets generally travel 3 feet or less when an infected person talks, coughs, or sneezes. The risk for transmission of pertussis is a function of multiple factors including clinical features of the source case as they relate to communicability (e.g., stage of illness, character of cough), proximity and duration of contact, ventilation, and use of appropriate infection control measures (mask, eye protection). Consult with a CDES epidemiologist as needed on a case-by-case basis regarding determinations of close-contacts.

Examples of close contact include:

1. Direct face-to-face contact with a symptomatic case-patient during the contagious period. This includes household and immediate family members, boyfriends/girlfriends, and child care contacts (those who spend many hours together or sleep under the same roof).
2. An obvious exposure that involves direct contact with respiratory, oral, or nasal secretions from a case-patient during the contagious period (e.g., a cough or sneeze in the face, sharing eating utensils, sharing water bottles, kissing, mouth-to-mouth resuscitation, or performing intubation or nasotracheal suctioning without a mask).
3. Close proximity for a prolonged period of time with a case-patient during the contagious period. Risk of droplet exposure increases with longer duration and closer proximity of contact.

Examples of persons who may be at increased risk include:

- non-household close friends or other social contacts
- some passengers during shared transportation
- some contacts at community activities or at the place of employment
- some healthcare workers caring for a case without wearing a mask
- children attending an after-school care group or play group on the same days

Note: Close contact does not include activities such as walking by a person or briefly sitting across a waiting room or office.

E. High-risk Cases and Contacts

High-risk persons include persons at increased risk for severe pertussis and persons who may transmit pertussis to persons at high risk for severe pertussis. High-risk groups are:

1. Children under one year of age: Increased risk for severe disease.

2. Pregnant women, particularly those in the last three weeks of pregnancy: Potential for transmission to the newborn, other pregnant women (e.g., in obstetrical offices or prenatal classes) and to health care workers.
3. Healthcare worker with face-to-face patient contact: Potential for transmission to persons (patients) at increased risk for severe disease
4. Close contacts of a pertussis case who have an increased likelihood of transmitting pertussis to individuals at high risk for severe disease (e.g., persons working with infants or pregnant women, members of household with infants and pregnant women).

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

Isolation of *B. pertussis* by culture and detection of *B. pertussis* by polymerase chain reaction (PCR) are the only ways to confirm the diagnosis of pertussis.

1. Nasopharyngeal Culture: Culture is the most specific test for pertussis. Culture from the posterior nasopharynx is most sensitive in the first 2 weeks of illness and is more sensitive in young children than in adolescents and adults. However, positive nasopharyngeal cultures have occasionally been obtained from untreated adults up to 6 weeks after the onset of any symptoms. Because *B. pertussis* is fastidious and its isolation in culture is easily obscured by the growth of other nasopharyngeal organisms, proper specimen collection and subsequent handling of the specimen will improve the rate of recovery. Specimens collected after the initiation of any type of antibiotic therapy are less likely to yield *B. pertussis* isolation. Since so many factors can affect the sensitivity of culture for *B. pertussis*, a negative culture result should not be considered evidence that pertussis has been 'ruled out'. (Throat and anterior nares swabs have unacceptably low rates of recovery of *B. pertussis* and should not be used.)
2. Polymerase Chain Reaction (PCR): PCR testing for *B. pertussis* should be used in addition to culture. It is at least as sensitive as culture and results are available more quickly. Published data suggests that PCR may detect *B. pertussis* when culture is negative. It is necessary to use Dacron® or rayon swabs on a metal handle. Calcium alginate swabs or wood handles can render the specimen unsatisfactory for PCR testing. A negative PCR result on an exposed symptomatic high-risk person such as a health care worker should not be considered evidence that pertussis has been 'ruled out'.
3. Direct Fluorescent Antibody (DFA) Testing: A DFA test was used for screening in the past but lacks sensitivity and specificity for *B. pertussis*. Use of this test is discouraged. No public health action is warranted by reports of positive DFA tests for pertussis.
4. Serologies: Although serology may have a role in the future, the lack of standardization of these antibody tests and their unknown correlation with pertussis illness limits their current usefulness. No public health action is warranted by sporadic reports of positive serologic tests for pertussis because cases are unlikely to be contagious by the time the tests are reported. Use discretion about the need for further investigation if a convincing serologic test is found among a well defined group with suspected on-going transmission. The best approach in such a situation may be to find an untreated person with a recent onset of illness and collect specimens for culture and PCR.

5. Susceptibility Testing: Routine susceptibility testing of *B. pertussis* isolates is not recommended since resistance to macrolide antibiotics is rare. Consult with CDES if a patient has a positive *B. pertussis* culture after completion of an appropriate course of antimicrobial therapy and patient compliance with therapy has been verified.

B. Tests Available at the Washington State Department of Health Public Health Laboratories (PHL)

PHL can perform microbiologic cultures and PCR for pertussis on posterior nasopharyngeal specimens. PHL can also confirm that pure isolates submitted from other laboratories are *B. pertussis*.

The policy with regards to testing for pertussis at PHL follows:

1. **Only samples approved by the local health jurisdiction (LHJ) will be accepted at PHL.** When submitting to PHL, appropriate samples for both standard microbiology cultures and PCR must be submitted simultaneously. LHJs should notify the Communicable Disease Epidemiology Section when they are sending specimens to the state lab.
2. In LHJs where there is **NO KNOWN** pertussis outbreak, PHL will offer cultures and rapid PCR testing of symptomatic patients in whom pertussis is suspected on the basis of:
   a. The duration or quality of their cough,
   b. Other associated clinical symptoms, and
   c. Known exposure to an infectious person with pertussis.

   This is done to rapidly identify areas with a pertussis outbreak. When a pertussis outbreak is documented, local public health staff should use the criteria described in #3.
3. In LHJs where there is a **KNOWN** pertussis outbreak, culture and PCR testing at PHL will be available for the following groups if no other testing options are available:
   a. Symptomatic (coughing) people in high-risk groups* who will benefit from rapid and highly sensitive diagnostic methods such as PCR
   b. Symptomatic (coughing) people who care for person in high-risk groups*

   * See Section 3E for definition of high-risk groups.

   Standard microbiological culturing for pertussis at private laboratories should be encouraged for all symptomatic persons living in areas with known outbreaks. When no other laboratory is available, samples can be submitted to the PHL for culture.

C. Specimen Collection

Obtain a posterior nasopharyngeal specimen as early as possible in the illness (during the first three weeks is optimum) and prior to administration of antibiotics. Instructions for proper specimen collection are included in Appendix A; they can accompany health department communicable disease staff on case investigations or be sent to health care providers upon request. Collection and transport procedures must be followed as closely as possible for the best results.

Be sure to include a completed PHL Microbiology Form with the submission

(http://www.doh.wa.gov/EHSPHL/PHL/Forms/Microbiology.pdf).

5. ROUTINE CASE INVESTIGATION

Interview the case and others who might be able to provide pertinent information.

A. Evaluate the Diagnosis

Review the clinical presentation and laboratory test results. Conduct a public health investigation for the following:

1. All confirmed and probable cases (see Section 3C).
2. Persons with a cough illness lasting at least 2 weeks in an outbreak setting.
3. Persons with a positive PCR for *B. pertussis* and a compatible illness whose duration of cough has been less than 14 days at the time of reporting.
4. Persons with an epidemiologic link to a confirmed case and a compatible illness whose duration of cough has been less than 14 days at the time of reporting.
5. Other high-risk persons with symptoms highly suspicious for pertussis who do not meet the probable or confirmed case definitions.

Note: For persons described in 2 and 3, follow-up on or after the 14th day after cough onset to establish duration of cough and criteria for clinical case definition.

B. Identify Potential Sources of Infection

During the initial interview, ask about contacts who had a respiratory illnesses compatible with pertussis during the 1 to 3 week interval prior to onset. Because mild or atypical illnesses are common, it is not always possible to identify the actual source of infection. If a potential source patient is identified, investigate this person as a possible case.

C. Identify Potentially Exposed Persons

1. Identify close contacts

Identification of close contacts of cases is important for three reasons:

- High-risk asymptomatic contacts and asymptomatic household contacts need prophylaxis.
- Low-risk asymptomatic contacts outside of the household need to be educated about seeking medical care and using respiratory etiquette if symptoms develop. These contacts can also be referred to their healthcare providers to discuss post-exposure prophylaxis.
- Symptomatic contacts may need testing, treatment or both.

Close contacts are identified through routine communicable disease interview of case or proxy. The top priority is finding exposed high-risk contacts (e.g., children under 1 year of age, pregnant women, healthcare workers), in order to provide prophylaxis promptly. If groups such as a class or a sports team are identified as close contacts, it may be helpful to obtain the name and phone number of teachers, principals, or coaches.

2. **Identify settings where the case spent time while communicable and where transmission to high-risk contacts may have occurred**

   These settings include schools, child care settings, workplaces, healthcare facilities and other organizations. See Managing Special Situations below.

3. **Prioritize follow-up of contacts with respiratory symptoms**

   Symptomatic contacts of confirmed pertussis cases may meet the confirmed case definition at the time of initial interview and are thus reportable; like other confirmed cases, they should be interviewed. Other symptomatic contacts of confirmed cases may not meet the confirmed case definition at the time of interview; determine in consultation with local health authority or CDES whether to act on these as if they were cases. For example, investigation of a smoker with a chronic cough that is unchanged since pertussis exposure is less urgent than inquiring after a daycare employee with a cough of 7 days duration.

D. Environmental Evaluation: None

6. CONTROLLING FURTHER SPREAD

A. Case Management

Treat cases: Make sure that the case is being appropriately treated with antibiotics (see Section 2H above). If a case has not had a medical evaluation, then ideally they should be referred to a clinician for assessment, laboratory testing, and consideration of treatment. The clinician should be made aware of the reasons for referral. If these clients can not afford laboratory testing, the clinician may consider taking advantage of the free pertussis culture services at PHL.

B. Infection Control Recommendations

1. Hospitalized patients should be cared for using droplet precautions; health care workers in out-patient settings should wear surgical masks and eye protection when evaluating proven or suspected pertussis patients. Droplet precautions should be maintained until 5 days after the patient is placed on effective therapy.
2. Work, School and Child-Care Restrictions: All cases and symptomatic contacts should be excluded from child-care, school, and health care settings until 5 days of therapy with an appropriate antibiotic has been completed (i.e., until day 6 after starting treatment). Treated persons can be considered no longer contagious after five days of antibiotics even if they continue to cough and/or if the course of antibiotic treatment is not yet completed. Cases who do not take appropriate antimicrobial treatment should be excluded from childcare, school, and health care setting for 21 days from onset of paroxysmal cough.
3. All cases and symptomatic contacts should also be taught “respiratory etiquette” and encouraged to avoid contact with other persons at social activities, especially those settings which might include high-risk persons.

C. Contact Management

1. **Symptomatic Contacts**

If a symptomatic close contact has not had a medical evaluation, then ideally they should be referred to a clinician for assessment, laboratory testing, and consideration of treatment. The clinician should be made aware of the reasons for referral. If pertussis is suspected, the symptomatic contact should be excluded according to the same guidelines used for cases. If these clients cannot afford laboratory testing, the clinician may consider taking advantage of the free pertussis culture services at PHL.

2. Chemoprophylaxis (Asymptomatic Contacts)

Most pertussis in adults and adolescents is neither diagnosed nor reported and antibiotic prophylaxis does not control the transmission of pertussis when it is widespread in the community. The effort to provide antibiotic prophylaxis for pertussis must focus on household contacts and high-risk close contacts of pertussis cases (see Section 3). All household members and high-risk asymptomatic close contacts of pertussis cases should receive antibiotic prophylaxis either from their healthcare provider or from the LHJ regardless of immunization status. Other asymptomatic close contacts can discuss the need for prophylaxis with their healthcare provider. Contacts with underlying immunodeficiency or lung disease should contact their healthcare provider promptly.

Initiating prophylaxis more than 3 weeks after exposure has limited benefit and is not recommended, with the exception of high-risk contacts for whom prophylaxis may be considered for up to 6 weeks after exposure (see Section 3 for contacts considered to be at high risk).

3. Active Immunization

Exposed children who received their third dose of DTaP 6 months or more before exposure to pertussis should be given a fourth dose at this time. Children who have had 4 doses of pertussis vaccine should receive a booster DTaP unless a dose has been given within the last 3 years or they are 7 years of age or older. Adolescents over age 11 who have not received Tdap should get it at this time. Those over age 11 who received a Td booster should receive Tdap if a 5 year interval has elapsed since the last dose. Tdap may be given at an interval of less that 5 years if the benefits of protection outweigh the risk of an adverse reaction.

Note: Post-exposure vaccination is not recommended as post-exposure prophylaxis, or in place of chemoprophylaxis if indicated, but rather but to prevent future infections.

4. Education

Advise close contacts of pertussis cases of the risk of infection; counsel them to watch for signs or symptoms of pertussis occurring within 21 days after the last exposure. The method for communicating with contacts will depend on the situation; schools, childcare settings and organized groups can often be efficiently contacted by letter or handout in collaboration with the respective administrators or leaders. If symptoms are present or develop in these contacts, they need to understand that respiratory etiquette (see Section 8B) should be followed and medical care should be sought promptly. Remember, providers must be made aware of the pertussis exposure in order to appropriately evaluate and treat the contact, and in order to limit risk to others in the office. During outbreaks and periods of increased community pertussis activity, local health care providers should be updated on the current situation and reminded about the signs and symptoms of

pertussis, diagnostic testing options, prophylaxis/treatment recommendations and infection control for the office by local health authorities.

D. Environmental Measures: None

7. MANAGING SPECIAL SITUATIONS

A. Case Works at or Attends School or Day Care (Probable or Confirmed Case)

1. Notification and Case Finding

a. Notify parents of children in the same classroom(s) as soon as possible but within 72 hours. Quicker notification is appropriate in settings with children under age 1 year. In addition to providing background information on pertussis and details regarding the exposure circumstances (e.g., date, time, setting), the notice should advise the parents to:

i) verify their child's pertussis immunizations and get remaining doses in the series if necessary;

ii) report any respiratory illness that occurs within 3 weeks of last contact with the case and seek medical care for diagnosis and appropriate treatment.

iii) obtain chemoprophylaxis for their child, if indicated.

b. Ask about pertussis-like illnesses (possible cases) among attendees or employees within the previous 4 weeks. In settings involving children under age 1 year, all potential cases should be investigated and necessary measures taken to stop further transmission.

2. Preventing Further Spread

a. Assess the immunization status of all students and refer for immunization as needed.

b. Recommend prophylaxis as indicated.

c. Refer symptomatic students, teachers, volunteers, and other staff to their health care providers for treatment and nasopharyngeal specimen collection.

d. Day care operators should notify their LHJ of any additional respiratory illness occurring during the period of surveillance. The advisability of new admissions to the facility should be evaluated according to level of risk for pertussis complications.

3. Exclusion from Day Care or School (Probable or Confirmed Case)

a. All confirmed and probable cases should be excluded from childcare or school until the 6th day after starting appropriate antimicrobial treatment (that is until 5 days are completed).

b. Confirmed and probable cases (along with PCR-positive persons and persons with pertussis-like symptoms who may not yet meet case definition) who do not take appropriate antimicrobial treatment should be excluded from childcare or school for 21 days from onset of cough. If cough ceases in less than 21 days without treatment, readmission can be discussed with local health authorities.

c. In settings where children under age 1 year have been exposed, the local health authority may also consider excluding asymptomatic contacts who elect not to take

antibiotics or persons who are not up-to-date with pertussis immunization (especially children who have not had the initial 3-dose series of a pertussis-containing vaccine) for 21 days after their last date of exposure.

B. Case is a Health Care Worker

The infection control practitioner (ICP) of the affected facility should identify and refer all symptomatic close contacts (patients and coworkers) for medical evaluation and presumptive treatment immediately. In addition, prophylaxis should be given to all asymptomatic health care workers with close contact because of the risk they would pose to other patients should they develop pertussis. Asymptomatic health care workers who have appropriately followed standard and droplet precautions (including wearing a surgical mask) during close contact with an infected patient do not require prophylaxis. Contacts may remain in the workplace if they comply with prophylaxis and lack respiratory symptoms; they should be under surveillance for 21 days after their last known exposure. Health care workers should contact the facility ICP if respiratory symptoms develop and stay away from the workplace until 5 days of antibiotic therapy have been completed, unless pertussis can be excluded as a cause of their symptoms (see section 4. A. 1 and 2). If the facility has no ICP, the LHJ can consult with CDES for guidance. Health care workers with direct patient contact should receive (or have already received) a dose of Tdap unless contraindicated.

C. Outbreak Situations

Pertussis outbreaks are defined as two or more cases clustered in time (e.g., cases that occur within 42 days of each other) and space (e.g., in a particular child care center or classroom). In outbreak settings, including households, a case may be defined as a cough illness lasting 2 weeks or longer. Outbreaks are more likely in certain settings, e.g., schools with a large proportion of unimmunized children or day care centers with many infants who have not completed a primary DTaP series. Outbreaks also occur in older students whose immunity to pertussis has waned after immunization.

If there are multiple cases of pertussis in a childcare or school setting, work with the administration to facilitate distribution of an appropriate letter to inform parents/guardians and staff about pertussis; local health care providers should also be alerted. Letters can be distributed to classes, grades, extracurricular groups, or to the entire childcare center or school depending on the situation. School-wide or community-wide notification through a media alert is best done by consensus with school officials and local health department staff.

In the setting of an outbreak, lab testing of each symptomatic contact may not be necessary or feasible. Consider limiting testing of symptomatic persons in this situation to high-risk contacts (see Section 3 for persons considered to be at high risk). Classroom-wide prophylaxis is generally not recommended except in high-risk settings such as child care settings where infants under 1 year of age are cared for. In rare situations, the DOH Immunization Program in conjunction with CDES may recommend an accelerated DTaP schedule for infants in an attempt to provide earlier immunity for this high-risk group.

For more information on outbreak management, see (http://www.cdc.gov/vaccines/pubs/pertussis-guide/guide.htm).

8. ROUTINE PREVENTION

A. Immunization Recommendations

Immunization with acellular pertussis vaccines in combination with diphtheria and tetanus toxoids as DTaP is recommended for all children younger than 7 years of age according to the following schedule:

Routine DTaP Vaccination Schedule

Dose	Age	Minimal Interval
Primary 1	2 months	N/A
Primary 2	4 months	4 weeks
Primary 3	6 months	4 weeks
Primary 4	15–18 months	6 months
Booster*	4–6 years	

* The booster dose is not needed if the fourth dose is given on or after the fourth birthday

For additional information regarding use of the DTaP vaccine during childhood, adverse reactions and contraindications see the most recent Red Book.

During spring 2005, two tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine (Tdap) products were licensed in the United State for use in adolescents. BOOSTRIX® was licensed for use in persons aged 10–18 years and ADACEL™ was licensed for use in persons aged 11–64 years. The Advisory Committee on Immunization Practices (ACIP) currently recommends that:

1. Adolescents aged 11–18 years should receive a single dose of Tdap instead of tetanus and diphtheria toxoids vaccine (Td) for booster immunization against tetanus, diphtheria, and pertussis if they have completed the recommended childhood diphtheria and tetanus toxoids and whole cell pertussis vaccine (DTP) / diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP) vaccination series (five doses of pediatric DTP/DTaP before the seventh birthday; if the fourth dose was administered on or after the fourth birthday, the fifth dose is not needed) and have not received Td or Tdap. The preferred age for Tdap vaccination is 11–12 years.
2. Adolescents aged 11–18 years who received Td, but not Tdap, are encouraged to receive a single dose of Tdap to provide protection against pertussis if they have completed the recommended childhood DTP/DTaP vaccination series. An interval of at least 5 years between Td and Tdap is encouraged to reduce the risk for local and systemic reactions after Tdap vaccination. However, an interval less than 5 years between Td and Tdap can be used.
3. Vaccine providers should administer Tdap and tetravalent meningococcal conjugate vaccine (Menactra®, sanofi pasteur, Swiftwater, Pennsylvania) to adolescents aged 11–18 years during the same visit if both vaccines are indicated and available.
4. Adults <65 years who have not previously received a dose of Tdap should receive a single dose of Tdap in place of a single dose of Td for booster immunization if the most

recent tetanus toxoid-containing vaccine was received at least 10 years earlier. Adults in close contact with an infant aged <1 year who have not previously received Tdap should receive a dose of Tdap; an interval as short as 2 years since the most recent Td is suggested.

5. Healthcare personnel in hospitals and ambulatory care settings with direct patient contact who have not previously received Tdap should receive a dose of Tdap; an interval as short as 2 years since the most recent Td is recommended.

   For additional information regarding the use of Tdap, see:

   Recommendations of the Advisory Committee on Immunization Practices (ACIP). Preventing Tetanus, Diphtheria, and Pertussis Among Adolescents: Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccines. MMWR 2006;55(RR03):1–34.

B. Prevention Recommendations

In addition to immunization, persons should practice "respiratory etiquette" or good health manners to stop the spread of respiratory pathogens.

Persons can keep respiratory pathogens to themselves by:

- Covering the nose and mouth with a tissue when sneezing, coughing or blowing the nose.
- Throwing out used tissues in the trash as soon as possible.
- Always washing hands after sneezing, blowing the nose, or coughing, or after touching used tissues or handkerchiefs.
- Washing hands often when sick.
- Using warm water and soap or alcohol-based hand sanitizers to wash hands.
- Staying home if coughing and febrile.
- Seeing a doctor as soon as possible if coughing and febrile, and following their instructions, including taking medicine as prescribed and getting lots of rest.
- If requested, using face masks provided in doctors' offices or clinic waiting rooms.

Persons can keep pathogens away by:

- Washing hands before eating, or touching eyes, nose or mouth.
- Washing hands after touching anyone else who is sneezing, coughing, blowing their nose, or whose nose is running.
- Not sharing things like cigarettes, towels, lipstick, toys, or anything else that might be contaminated with respiratory germs.
- Not sharing food, utensils or beverage containers with others.

ACKNOWLEDGEMENTS

This document is a revision of the Washington State Guidelines for Notifiable Condition Reporting and Surveillance published in 2002 which were originally based on the Control of Communicable Diseases Manual (CCDM), 17th

Edition; James Chin, Ed. APHA 2000. We would like to acknowledge the Oregon Department of Human Services for developing the format and select content of this document.

UPDATES

December 2007:

Section 3D: Revisions were made to the examples of close contact.

Section 6C(2): "Regardless of immunization status" was added to the following statement, "All household members and high-risk asymptomatic close contacts of pertussis cases should receive antibiotic prophylaxis either from their healthcare provider or from the LHJ regardless of immunization status."

December 2008:

Section 3C: Persons with a positive PCR test and a paroxysmal cough of less than 2 weeks duration should be classified as a "suspect" case.

Section 4C: The link to the PHL Microbiology form was updated.

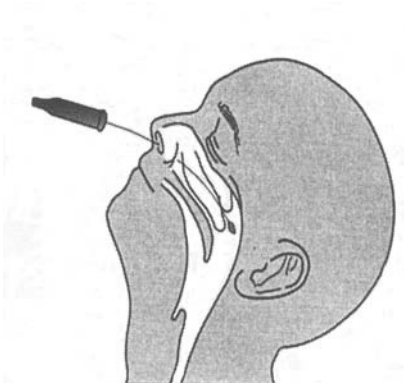
March 2009:

Section 4B: The policy for testing for pertussis at PHL was revised.

APPENDIX A: SPECIMEN COLLECTION PROCEDURES

1. If needed, request a *Bordetella pertussis* Collection Kit from PHL by calling 206-418-5579. The kit includes appropriate forms, two Dacron® polyester swabs, charcoal media (for pertussis culture), a sterile transport tube (for pertussis PCR), shipping materials and detailed instructions regarding collection and shipping of specimens.
2. Collect posterior nasopharyngeal specimens as soon as possible after symptoms develop. Specimens may be collected up to four weeks after onset as long as antibiotics have not been started.

   Note: Throat specimens, nares swabs, and sputum samples are unacceptable specimens and will not be processed.
3. Use a Dacron® or rayon swab on a flexible wire shaft to collect a nasopharyngeal specimen. Do not use wooden shafted swabs or Calcium alginate swabs (contraindicated for PCR testing). Healthcare providers may consider piggybacking two swabs if a specimen is need for both culture and PCR.

   a. Bend wire(s) so that it mimics the curve of the nasal airway.

   b. Gently pass swab(s) through the nostril to the posterior nasopharynx. *DO NOT* force the swab(s). A slight resistance will be felt when the posterior nasopharynx is reached.

   c. Rotate the swab(s) and ideally leave in place for 10 seconds or until the patient coughs.
4. Aseptically streak one nasopharyngeal swab onto the charcoal transport media for culture. Leave the swab on top of the media. Do not stab the swab into the charcoal slant. Cut the top of the wire with scissors so the cap of the media tub can be screwed on. Bending the wire into the tube can introduce contamination (skin flora) into the media. If indicated, place another swab into a sterile screw top transport tube for PCR. If able to collect only one swab, use the charcoal transport media and submit a specimen for culture only. Swabs for PCR will not be accepted without a swab for culture.
5. Label the tubes with the client's name and complete all sections of the Public Health Laboratories' Nose and Throat form available at: http://www.doh.wa.gov/EHSPHL/PHL/Forms/Nose&ThroatSpecs.pdf.
6. Ship specimens at ambient temperature. They should reach the Public Health Laboratories within 24 hours of collection. Since January 1, 2007 the required shipping label is "Biological Substance, Category B, UN 3373".

Please contact the Special Respiratory Unit of the Communicable Disease Microbiology Laboratory at PHL (general: 206-418-5400, direct 206-418-5492) for handling and transport issues not specifically addressed in these guidelines.